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ABSTRACT

About 2,200 immigrant children in Sweden were studied by means of tests and teacher questionnaires. The children, representing 36 nationalities, were born outside Sweden and were distributed over the nine grades of the Swedish Comprehensive School. Various functional language skills in Swedish as a second language (L2), nonverbal intelligence and socio-emotional adjustment as measured by teacher opinions were studied as functions of age and length of residence. These two independent variables were found to be uncorrelated with each other and with a number of other background variables. All language variables were rather strongly related to age, and the F ratios were highly significant with one exception, Free Oral Production. The language variables were weakly or not at all related to length of residence, with the exception of Free Oral Production. The socio-emotional variables were not related to age, nor to length of residence. The pattern of nonverbal intelligence is inconsistent. As the relation of language to age is positive, i.e., L2 learning ability increases with age in the span of 7 - 17, and no optimum is found, it is suggested that the theoretical position of Penfield and Roberts, Lenneberg and others, which predict an optimum in L2 learning ability before puberty, is not tenable. (Author/AM)

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AGE AND LENGTH OF RESIDENCE AS VARIABLES RELATED TO THE ADJUSTMENT OF MIGRANT CHILDREN, WITH SPECIAL REFERENCE TO SECOND LANGUAGE LEARNING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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1. BACKGROUND AND PROBLEM

1.1 Age and second language acquisition: Theory

The idea that children learn a second language better the younger they are, is very old. It was brought forward by the Quousque Tandem movement (Elfstrand, 1915), but is probably much older.

More recently, attempts to explain this assumed optimum have been made. Many authors, like Donoghue (1964), claim that the optimal age is also the best time for introducing a foreign language in the elementary school. Her arguments for an early optimum, and an early training, are:

a) neurological reasons, notably those of Penfield and Roberts.

b) psychological reasons: young children cannot and need not rely on reading and writing. They retain and repeat audio-orally. Their imitative ability seems to be better than later in life.

In order to minimize harmful effects of brain operations, neurosurgeons have tried to avoid areas of vital importance for a normal life, i.e. areas of various speech functions. Penfield and Roberts (1959) discuss such functions in connection with brain damage. Their theories of foreign language learning do not, however, seem to be obvious conclusions of their neurological findings and reasoning. Nevertheless, the opinions of such distinguished scientists must be taken seriously. They are: "Before the age of nine to twelve, a child is a specialist in learning to speak. At that age he can learn two or three languages as easily as one." (p 235) "... for the purposes of learning languages, the human brain becomes progressively stiff and rigid after the age of nine." (p 236) "The physiological reason for the success in the home is that the child's brain has a specialized capacity for learning language - a capacity that decreases with the passage of years." (p 240) "There seems to be little if any relationship between general intellectual ability and the ability of a child to imitate an accent. Capacity for imitation is maximum between 4 and 8. It steadily decreases throughout later childhood." (p 243)

These very exact predictions allow us to construct a theoretical learning ability curve with an optimum, i.e. 100% learning capacity, between 4 and 8. It starts decreasing around the age of nine to twelve and levels out around puberty to, let us say, 50% of the maximum capacity as a reasonable guess.

Such a curve is rather unlikely from other theoretical starting points. Piaget theory predicts increasingly developed and differentiated intellectual functions with increasing age. Developmental studies (see e.g. Bayly, 1955) show that intellectual functions go on increasing till around the age of 30. It seems unlikely that language learning ability should be negatively correlated with other intellectual functions.

Lenneberg (1967) discusses the learning of L_1 along the same lines as Penfield and Roberts discuss the learning of L_2: recovery from brain damage and anatomical and physiological parameters of brain development. Recovery from brain damage, however, is a bit doubtful as an indication of learning capacity per se. Recovery may well take place after puberty. Lenneberg himself states (p 143): "Aphasias acquired ...

after the age of eighteen may recover within a three-to-five months period. Symptoms that have not cleared up by this time are irreversible." But he adds: "There are a few clinical exceptions to this picture." He furthermore concludes: "... the language disorder is not a learning impairment. A patient with aphasia has not lost other, more general abilities to learn. There are reasons to believe that recovery is due to physiological restoration of function rather than a learning process." His own conclusion (p 153) does not seem completely logical: "Notice that the earlier the lesion is incurred, the brighter is the outlook for recovery. Hence we infer that language learning can take place ... only between the age of two to about thirteen." As we shall see later, there is evidence (Jenkins, 1972) that some language learning (L_1) takes place before as well as after these age limits.

The development of various brain parameters leads Lenneberg to the conclusion that puberty is a milestone for the facility in language acquisition (p 168). The opposite conclusion is in fact, however, possible as far as the learning of L_2 is concerned: Language learning takes place most efficiently when all brain parameters are fully developed.

Carroll (1963) suggests that the ability to acquire a nativelike accent deteriorates towards puberty. He carefully adds that this is when specific instruction is not given.

Strevens (1972) considers age to be the most important among a number of causes to variations in pronunciation proficiency and gives a list of variables which he assumes to lead to a diminished pronunciation learning ability. But he admits "that a small number of adults retain these faculties." He furthermore believes that adults possess certain qualities which may counterbalance the assumed disadvantages. On the basis of these two sets of variables he formulates the antagonistic principles of Innocence and Sophistication and ends up with the following conclusion: "People who learn a second ... language <u>can</u> learn a good pronunciation, at any age."

1.2 <u>Age and foreign language acquisition: research</u>

Kirch (1956) claims superiority in German pronunciation of grade 1 pupils over grade 3 and 6 pupils and college students, but gives no actual figures.

Dunkel and Pillet (1957) compared pupils of grade 3 and 4, learning French, with each other and with college students. The college students were superior to the grade 3 and 4 children, who in turn showed no marked differences, on tests of readin and listening comprehension, oral reading, vocabulary, grammar and writing. The authors stress the fact that the age distributions to a great extent overlap and for this and other reasons tend to disregard the tendencies found.

Among the earliest research, directly aimed at investigating age effects experimentally, seems to be that of the Swedish Board of Education. The evaluation part of the experiment was reported in two unpublished reports by Ekstrand (1959, 1964). About 1.200 pupils in grades 1- 4 were taught English by means of a purely audio-visual course, i.e. with the teacher factor under control. The course extended over one semester. Pupils in areas of different dialect and degree of urbanization

took part in the experiment. When quarter of year of birth was plotted against pronunciation and listening comprehension, no optimum could be traced. A straight line was the best fit. The slope was such that the older children did significantly better than the younger ones.

Brega and Newell (1965) compared two high school French groups of pupils, one with a preceding FLES program in French, the other one without such a program. They found that the first group was superior to the second on the four MLA tests. Unfortunately, the first group was also intellectually superior, which was not corrected for.

Bland and Keislar (1966) compared 4 preschool with 6 grade 5 children on a completely individualized program in French. The children could run a card with a recorded phrase through a machine as many times as they wished. The time used to reach a 25 item criterion, including listening comprehension, oral production and pronunciation was measured. The grade 5 children used 4.5 -11 hours and the preschool children used 12.5 -17.5 hours. This approach is theoretically important, though the number of Ss in this particular experiment is very small.

Asher and Price (1967) compared pupils of 8, 10, 14 and 18-20 years of age as to their ability to learn to respond to Russian commands, during four sessions with a duration of a few minutes each. The adults were much superior to the 14-year olds, who in turn were superior to the 10-year-olds, and so on.

Asher and Garcia (1969) tested the pronunciation of 71 Cuban and 30 American children of different ages. The group being 1 - 6 years old when entering the U.S.A. had the best pronunciation. Next came the group who were 7 - 12 and last the group who was 13 - 19 years of age at the time of migration. This inverse relationship with age is obscured, however, by the fact that pronunciation also became better with longer stay. The probable correlation between age and length of residence, as well as sex differences and proportions, was not controlled.

In Denmark, English was introduced in grades 4, 5 and 6 and the results were compared after 80 and 320 hours of instruction (Florander & Jansen, 1969; Mylov, 1972). Grammar, vocabulary and reading comprehension were tested with 300 - 400 pupils. The grade 6 pupils were significantly better on both occasions, but the difference diminished considerably between testing occasions.

Olson and Samuels (1973) taught German speech sounds over ten 20-minute periods to 3 groups of students, aged 9.5 - 10.5, 14 - 15 and 18 - 26 years. Over-all and group differences were small, but statistically significant, except between the two older groups.

Jenkins (1972) reports some age effects on the preception and production of synthetic speech sounds. Studies with 2-, 6- and 10-month old children, using the orientation reflex (heart rate change) and its extinction as indices of learning, showed that while the 2-month-olds showed no reliable discrimination, the 6- and 10-month-olds showed good discrimination. The learning of speech sound differences thus starts at a very early age. Further research showed that learning to perceive new, i.e. artificial speech sound categories is very difficult, but possible, with 10-year-olds and adults. No formal comparisons between age groups were performed.

Toukomaa (1975), studying Finnish immigrant children in Sweden, has found that they learn Swedish better, the older they are by the time of migration. As Toukomaa clearly recognizes the importance of lenght of residence (LOR) - "Time may be the directly most importantvariable (p 27)" - he uses partial correlations to control the rather strong correlation between age and LOR in his material. As he uses Finnish and Swedish tests of verbal intelligence, not tests of functional language, and uses different tests on different age levels, his comparisons are somewhat uncertain. He ascribes the age effects to the pupils' better mastery of their native language.

The majority of the research reviewed points in a definite direction: second language learning capacity increases with age, with a few exceptions.

1.3 Length of residence (LOR), its impact on the linguistic, social and emotional adjustment of migrant children: theory and research.

With regard to L_2 learning, no special theory seems to have been laid out. It is generally taken for granted that the new language is learnt with time, see e.g. Toukomaa, 1975, p 27. Swedish experiences (M. Ek, advicer of the Swedish Board of Education, personal communication) are that migrant children who are given no or inadequate instruction may spend years literally in silence, however.

When studying the impact of LOR, Toukomaa (op. cit.) finds that L_1 seems to deteriorate faster than L_2 is acquired, in spite of instruction in both languages. The language shift, i.e. the point when L_2 becomes the better language, seems to be between 4 and 5 years from the time of migration. Also the research of Asher and Garcia (op. cit.) suggests that LOR is an important variable.

With adults, the impact of LOR on adjustement of other kinds is studied extensively, which does not seem to be the case with children. With regard to emotional and social adjustment, several theories are relevant. The concept of culture shock suggests that the confrontation with a new culture may lead to emotional disturbance. Looking closer into the possible mechanisms of this, it seems that psychodynamic as well as learning theory based theories of neurosis agree on at least one point: neurotic behavior is typically created either by a traumatic event or by a conflict of a lasting character. Migration is hardly a traumatic event in the true sense of the word, but it may well create a lasting conflict situation. Emotional adjustment may then in some cases be expected to grow worse, or at least not improve, with time. This prediction gains support from the theory and research on stress (Selye, 1958). The defence mechanisms of the body become engaged in resisting stressors. This wears the organs. Eventually various psychosomatic symptoms appear, but typically not until considerable time has elapsed from the onset of stress. Migration may well be regarded as a stressor. Anthropological findings suggest that the habituation to a new culture is more than learning a language and a number of new behavior patterns. The old ways of thinking and feeling disappear only slowly, while the learning of new ways takes considerable time. Furthermore, all behavior has a communicative significance (Hall, 1959). Much confusion and conflict is created by mutual misinterpretation of behavior. Hence, we would expect adjustment to be a slow, sometimes negative process, to a great extent independent of language.

1.4 Problem.

The research on age and LOR carried out so far, typically suffers from one or more of the following limitations, in some cases imposed for experimental reasons: restricted time of instruction, short duration of experiment, limited contents, restricted method, questionable validity of tests, limited number of variables tested, questionable selection of variables, limited number of Ss, instruction carried out without the support of an authentic linguistic and cultural milieu. This study tries to answer the question: What happens when age and LOR are studied as indenpendent variables with a large group of students in an authentic environment, and when a number of other independent variables, like teaching techniques, amount of teaching, teacher personality, teacher competence, etc, are allowed to vary freely under field conditions?

2. METHOD

2.1 Subjects.

The population studied consists of all immigrant pupils in school ages who in the spring of 1966 were registered in the Swedish comprehensive school and regarded as needing special tuition in Swedish, and consequeantly given such tuition. This definition automatically rules out all pupils not registered or whose need of tuition had not been discovered. No resources to trace such children were at our disposal at the time of data collection.

The data collection procedures and various statistics regarding the population studied are accounted for elsewhere (Ekstrand, 1974). There were about 2.400 pupils, fitting the definition. Data for 2.189 such pupils (90%)were obtained.

2.2 Instruments.

Various data about the pupils, like age, length of residence, nationality, sex, grade etc were obtained by means of a questionnaire to the teachers. They were also asked to express freely their views on the pupils' progress in school, in Swedish and their social and emotional adjustment. These judgements were then quantified into a five-grade scale, where 1 is bad progress or adjustment and 5 is excellent progress.

The tests belong to either of three domains: pure language tests (functional Swedish) intelligence tests and tests of reading skill (oral reading).

The language tests consist of 6 subtests, which were constructed for this study:

Pronunciation. Imitation, recorded on tape, of 12 standard phrases, read from a sound tape. The recordings are rated with respect to over all quality.

Dictation. A piece, consisting of 11 phrases, is read from a tape, 3 times a phrase.

Listening comprehension. 51 phrases are read from a tape. A series of 5 pictures belong to each phrase (255 pictures). The pupil is to choose the picture he thinks best illustratesthe phrase. He does not need to be able to read and write.

Reading comprehension. The same series of pictures are used again, with a phrase printed below each series. The phrases differ from the LC test. No writing is needed.

Free oral production. The pupil is to describe the contents and happenings of 3 pictures. The answers were recorded and rated by 3 judges.

Free written production. The pupil is to describe 1 picture. The sketch is rated.

Thus, 4 out of the 6 tests measure active skills on the part of the pupils. The intelligence tests consist of a non-verbal test for each of the Thurstone R, N and

S factors, called DBA 4, 7 and 8, respectively and standardized on Swedish pupils. The reading skill tests consist of 3 individual subtests, each consisting of a short piece to be read aloud. The time limit is 2 minutes for each test. Number of words read, time, if less than 2 minutes, and number of errors are scored.

3. RESULTS

3.1. Checks on missing data.

For most questions in the teacher questionnaire, there is a varying % of "No information given", as the teachers have not in every case known the answer. In order to study if the missing back-ground data are systematically related to the measurements in a way that might invalidate the results, the dichotomy data/no data in each background variable was correlated with the tests and teacher judgements pointbiserially. Out of 506 coefficients, 14 were between ± .20 and the rest (492) were between ± .10. As these coefficients are so low that they may be regarded as negligible, there does not seem to be any bias in the background data of importance for this particular study.

The tests have been completed to a varying degree. There are many reason for this. The DBA tests can be used from grade 4 only. Free oral production and Pronunciation were for economical reasons administered to samples of pupils only. Some tests are not possible to carry out with too young or too newly arrived children. Whatever the reasons, the question of interest is whether the drop out is systematic in a way which invalidates the results or not.

To test for this, pointbiserial correlations were run between the dichotomy "test completed/ not completed" for each test, against the values for each of the other tests. A high correlation indicates that the missing results are systematically related to good or bad performance in other variables. Out of 576 coefficients, 5% were not possible to calculate (too few cases), 2% fall between ± .37, 18% between ± .30 and 75% fall between ± .10. These data suggest that no systematic selection affects the variables under study.

3.2 Intercorrelations between age, LOR and some other background variables.

χ^2 and contingency coefficients (C) were computed between age, LOR, nationality, father's occupation in Sweden and in the native country, mother's occupation in Sweden and in the native country, number of children in the family, grade, type of class, teaching materials used and previous knowledge of Swedish.

Age is strongly correlated with grade only. The product moment correlation is.93, which means that the pupils on the whole were placed in the proper, or at least an adjacent, grade with respect to their age.

LOR is strongly related to "Previous knowledge of Swedish" only, which is a perfectly natural correlation. In all, the lack of substantial correlations with other background variables means that they need not to be controlled in order to study age and LOR, which is the purpose of this paper.

3.3 Effects of age.

The pupils were grouped in 26 groups according to third of year of birth. 1 = born 1949 or earlier, 2 = born Jan. - April 1950 (16:1-4 years at the time of testing), 3 = born May - August, 1950 (15:9- 16:0), etc.

The median of LOR in the population studied is 10.5 months. 50% fall between Q_1 = 6.8 months and Q_3 = 17.8 months. The mean of age is 11:6 years, s = 2:6 years. As age and LOR are uncorrelated, the distribution of LOR is roughly valid for all age groups.

The results of the analyses of variance of age differences in all measurements are given in table 1. The ω^2 gives the proportion of variance explained by age. It is conventional to disregard differences, even if significant, if the ω^2 is less than .005 (5%).

The teacher judgements of adjustment are not at all related to age. Except DBA 4, DBA 7 and Free oral production, all other variables are significant, on the .1% level (Pronunciation 5%). When extreme age groups (8-10 vs 12-17 years) are compared, also DBA 4 and 7 become significant on the .1% level, while Free oral production still is nonsignificant.

Table 1 in about here

A few examples of plots of means of the age groups are given in fig. 1. Test scores, transformed to a 9 grade scale with a mean of 5 and a standard deviation of 1.96 are given on the ordinate, thirds of year of birth on the abscissa.

Fig 1 in about here

It should be noted that the teachers tend to judge the pupils' behavior as a unity and that their judgements of progress in Swedish are more strongly correlated with emotional and social adjustment than with the language tests.

Thus language learning ability improves with age, as does intellectual functioning, while social and emotional adjustment seems to be nonrelated to age.

3.4 Effects of length of residence (LOR)

Analyses of variance are given in table 2. The ω^2 values are, with one exception, very low. Free oral production becomes considerably better with time, but not with age, as noted above. The only variables otherwise related to LOR are Listening comprehension and Free written production.

As predicted, the adjustment variables are not related to LOR. Astonishingly, most language variables are very weakly related to LOR. This is probably due to the fact that only 8.3% of the pupils have a longer LOR than 2 years and language learning as a function of time is a slow process.

Intellectual functions are practically not at all related to LOR. For reasons of space, no plots can be given.

Table 2 in about here

4. DISCUSSION AND CONCLUSIONS

The age effects found in this study go straight against the basic theory of second language acquisition. No optimum is found. On the contrary, language learning ability is growing monotonously and almost linearly with age. The reasoning of Penfield and Roberts and also of Lenneberg must be reversed: the more developed the brain is, the better it is suited for language learning, in the span of 8 - 16:4 years.

Besides biological factors, the general development of perceptual, intellectual and motor factors probably contribute to language learning ability. Toukomaa (1975)

considers the development of L_1 to be of the greatest importance for the learning of L_2. His own correlations, however, show that L_1 explains only between 10 and 25 % of the variance in the L_2 variables studied.

The results of this study with Ss learning L_2 in an authentic linguistic milieu and experiencing all the communicative needs that a new social and cultural environment creates, support the results of the majority of age studies with Ss learning L_2 in their native country. Whether other milieu factors may play a part, interacting with age, will be subjected to further analyses.

The social and emotional adjustment, as judged by the teachers, does not seem to be related to age. There is no wellfounded theory, neither very much research to be compared with this finding.

Most language variables are very weakly related to LOR. A comparison of ω^2 values show that age is a much better predictor of L_2 acquisition than LOR. One possible explanation is that the L_2 acquisition is such a slow process that a time span, much larger than in this study, is needed to give any effects. Another hypothesis is that, contrary to common belief, the time spent in a foreign environment is of secondary importance. Quantity and quality of instruction, motivation and energy of the individual and, not least important, the pattern of verbal and nonverbal contact and communication with the native population may be far more important factors.

There is one clear exception to this finding. It is interesting to note that the only language variable which is unrelated to age, Free oral production, is also the only variable that is strongly related to LOR. This implies, among other things, that conversation can best be learnt in an authentic milieu, a point that language teachers have argued for centuries.

In accordance with theoretical predictions, social and emotional adjustment does not improve with LOR. Intellectual variables seem not to be affected by LOR.

Finally, some practical consequences of these findings. Early second language teaching cannot be based on the prevailing theoretical foundations. It may still be a good idea with early L_2 teaching, but it should be based on administrative and other practical considerations. In Sweden, most pupils learn two or even three foreign languages in primary and secondary school. Language learning has to start early. On the other hand, the findings of this study should prove positive for adult education.

The instruction in L_1 and L_2 for migrant children, as well as the supervision of their emotional and social adjustment must be given much larger resources than is done at the moment. This study from 1966 and Toukomaa's from 1972 both suggest that the linguistic and socio-emotional adjustment processes need speeding up. Teaching techniques and materials, as well as the training of teachers, psychologists, councellors and others, must be developed and improved.

Table 1 Analyses of variance for age differences (third of year of birth)

df between groups = 25

Variable	df within	SS between	SS within	MS between	MS within	MS total	F	p	ω^2
1. Progress in school	1796	- 57.1	1604.5	2.3	.9	.9	2.6	.01	.034
2. Social adjustment	1822	- 24.7	1371.3	1.0	.8	.8	1.3	NS	.018
3. Emotional adjustr.	954	- 18.2	634.5	.7	.7	.7	1.1	NS	.028
4. Progress in Swedish	1254	- 27.4	1037.6	1.1	.8	.8	1.3	NS	.026
5. Listening comprsh.	1310	+ 6319.4	67739.4	252.8	51.7	55.5	4.9	.001	.085
6. Reading comprehens.	1275	+ 47869.3	157253.3	1914.8	123.3	157.8	15.5	.001	.233
7. RLS 1 Time	1244	- 366733.4	1543216.3	14669.3	1240.5	1505.1	11.8	.001	.192
8. RLS 1 Words	1254	+ 20572.0	80139.9	822.9	63.9	78.7	12.9	.001	.204
9. RLS 1 Errors	1254	- 1960.4	26198.2	78.4	20.9	22.0	3.	.001	.070
10. RLS 2 Time	1243	- 751025.0	2519952.0	30041.0	2027.3	2579.6	14.8	.001	.230
11. RLS 2 Words	1251	+ 3875.2	22507.2	155.0	18.0	20.7	8.61	.001	.147
12. RLS 2 Errors	1249	- 1458.5	16855.2	58.3	13.5	14.4	4.3	.001	.080
13. RLS 3 Time	1194	-1001275.6	2270866.0	40051.0	1901.9	2684.3	21.1	.001	.306
14. RLS 3 Words	1201	+ 22134.3	69405.2	885.4	57.8	74.7	15.3	.001	.242
15. RLS 3 Errors	1200	- 3897.1	38471.3	155.9	32.1	34.6	4.9	.001	.092
16. DBA 4		Not computed because of no cases in one or more cells							
17. DBA 7	240	+ 137.7	971.4	5.5	4.1	4.2	1.4	NS	.124
18. DBA 8	710	+ 11571.3	73938.5	462.9	104.1	116.3	4.4	.001	.135
19. Dictation	1131	+ 72218.9	797676.6	2888.8	263.2	320.0	11.0	.001	.195
20. Free written prod.	1034	+ 585.8	3349.2	23.4	3.2	3.7	7.2	.001	.149
21. Pronunciation	289	+ 133383.6	820286.5	5335.3	2838.4	3037.2	1.9	.05	.140
22. Free oral product.	289	+ 10643.3	95772.0	425.7	331.4	338.9	1.3	NS	.100

A sign in the column for SS between indicates if the variable is negatively or positively correlated with age.

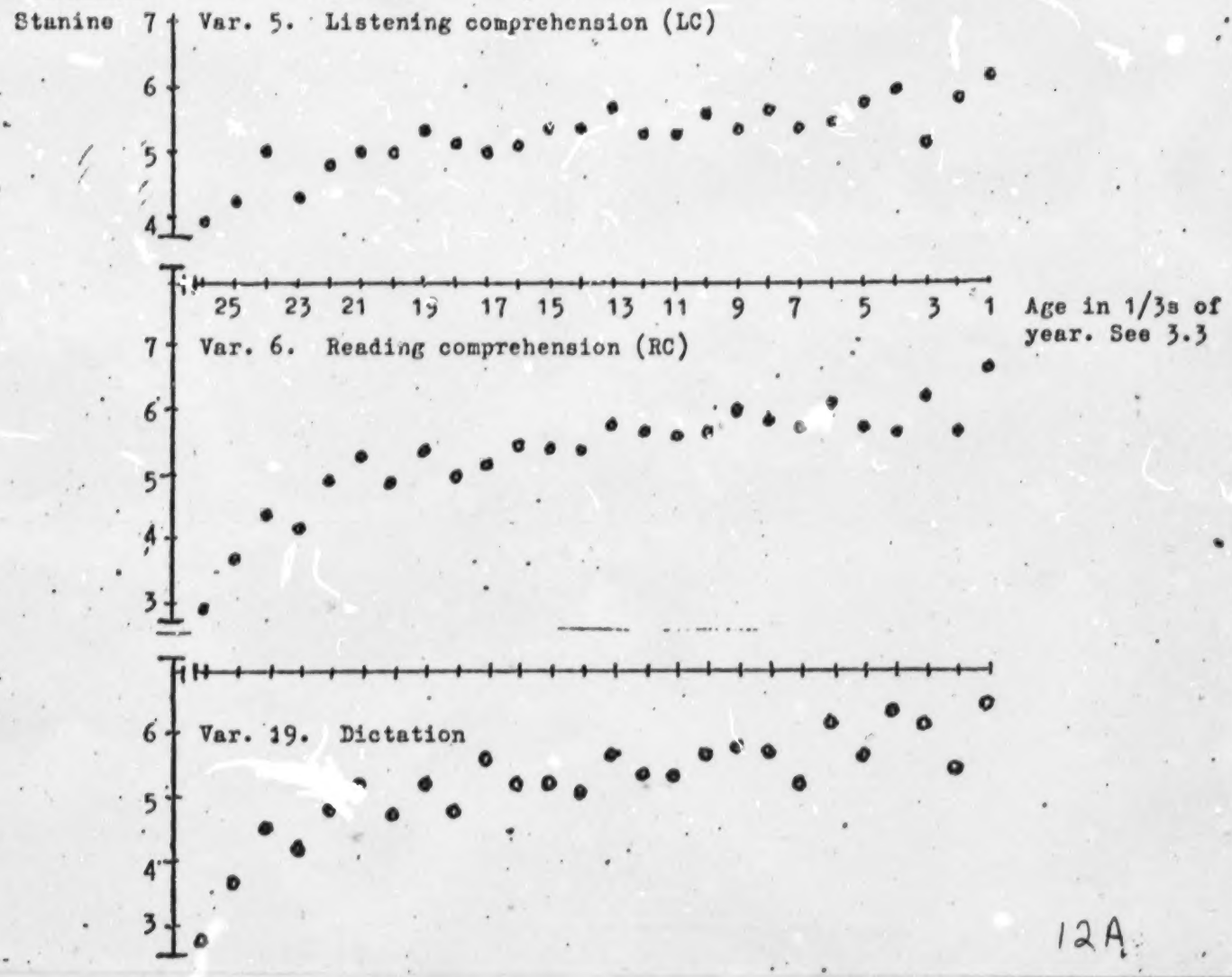
Table 2 Analyses of variance for differences in length of residence (0-8 months against 2 years or more)

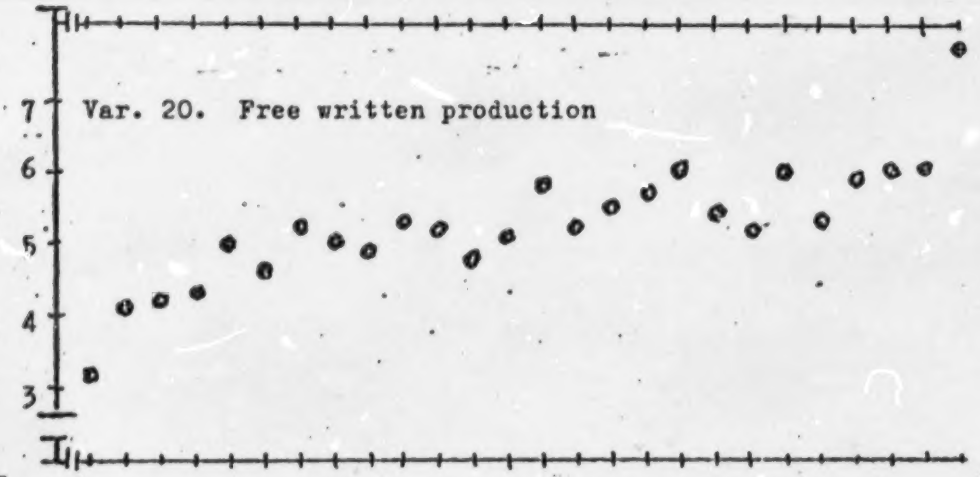
df between groups = 1

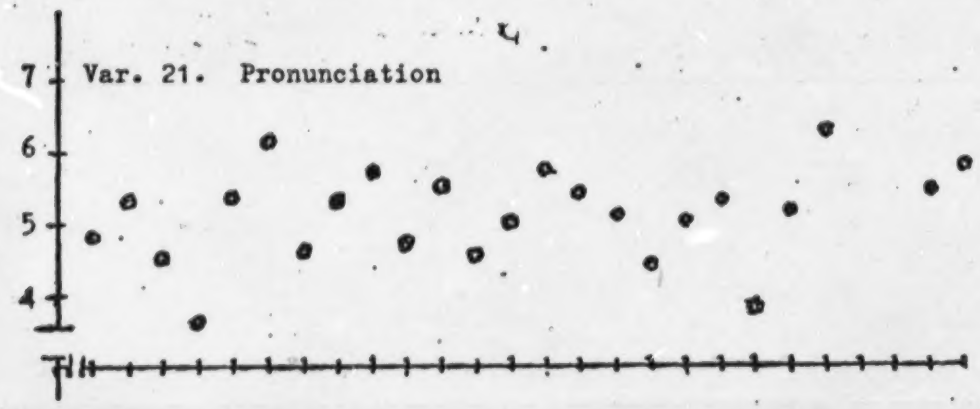
Variable	df within		SS between	SS within	MS between	MS within	MS total	F	p	ω^2
1. Progress in school	874	+	1.0	823.8	1.0	.9	.9	1.06	NS	.001
2. Social adjustment	869	+	.3	680.1	.3	.8	.8	.42	NS	.001
3. Emotional adjustment	479	-	.3	286.8	.2	.6	.6	.42	NS	.001
4. Progress in Swedish	586	+	.5	494.6	.5	.8	.8	.62	NS	.001
5. Listening comprehens.	618	+	2097.9	35694.6	2097.9	57.8	61.1	36.32	.001	.056
6. Reading comprehension	597	+	3197.3	95003.8	3197.3	159.1	164.2	20.09	.001	.033
7. RLS 1 Time	581	-	11469.5	643850.1	11469.5	1108.2	1126.0	10.35	.01	.018
8. RLS 1 Words	587	+	42.1	47547.0	42.1	81.0	80.9	.52	NS	.001
9. RLS 1 Errors	587	-	325.2	11528.1	325.2	19.6	20.2	16.56	.001	.027
10. RLS 2 Time	580	-	23755.5	1131132.5	23755.5	1950.2	1987.8	12.18	.001	.021
11. RLS 2 Words	585	-	5.9	13672.3	5.9	23.4	23.3	.25	NS	.000
12. RLS 2 Errors	585	-	186.7	8246.8	186.7	14.1	14.4	13.24	.001	.022
13. RLS 3 Time	558	-	33812.1	1326640.6	33812.1	2377.5	2433.7	14.2	.001	.025
14. RLS 3 Words	563	+	101.0	41517.5	101.0	73.7	73.8	1.37	NS	.002
15. RLS 3 Errors	563	-	607.2	20180.6	607.2	35.8	36.9	16.9	.001	.029
16. DBA 4	98	+	11.7	5356.1	11.7	54.7	54.2	.21	NS	.002
17. DBA 7	106	-	.8	509.5	.8	4.8	4.8	.16	NS	.002
18. DBA 8	325	-	1383.4	39411.1	1383.4	121.3	125.1	11.41	.001	.034
19. Dictation	523	+	3087.7	169362.4	3087.7	323.8	329.1	9.53	.01	.018
20. Free written product.	476	+	83.9	1656.1	83.9	3.5	3.6	24.11	.001	.048
21. Pronunciation	142	+	18740.6	482257.8	18740.6	3396.2	3503.5	5.52	.05	.037
22. Free oral production	142	+	10066.8	35189.1	10066.8	247.8	316.5	40.62	.001	.222

A sign in the column for "SS between" indicates if the variable is negatively or positively correlated with age

Figure 1. Examples of plots of test results as functions of age.




Var. 20. Free written production
7
6
5
4
3


Var. 21. Pronunciation
7
6
5
4

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